6

The Fiscal Stimulus of 2009–2010: Trade Openness, Fiscal Space, and Exchange Rate Adjustment

Joshua Aizenman, *UCSC and NBER*
Yothin Jinjarak, *SOAS, University of London*

I. Introduction

The global crisis of 2008–2009 focused attention on the role of fiscal policy at times of collapsing aggregate demand. Concerns about experiencing a reincarnation of the great depression induced the Organization for Economic Cooperation and Development (OECD) (high-income group) and emerging market countries to invoke extraordinary policies for extraordinary times. Countries adopted sizable fiscal stimuli, augmented by unprecedented monetary expansions supported by elastic swap lines between the Federal Reserve and the European Central Bank, and between the Fed and four emerging markets. The flight to quality and the shortage of dollar liquidity posed a special challenge for emerging markets, inducing them to supplement these policies with both large sales of foreign currencies at the height of the crisis and with sizable depreciations.

Yet there has been a remarkable heterogeneity in the magnitudes of the fiscal stimuli, and of the exchange rate depreciation. The differential patterns of response are traced in table 1, summarizing the fiscal stimulus/GDP and the depreciation rate in 32 countries, chosen by data availability. The first three columns overview the crisis related fiscal stimulus /GDP, 2009–2011, in OECD countries and emerging markets. The crisis led to a significant fiscal stimulus in the United States, Japan, and Germany, the magnitude of which increased from 2009 to 2010, reflecting various lags associated with fiscal policy. The fourth and the fifth columns report the massive "bailout" transfers to the banking system in the United States, Germany, and the United Kingdom that attempted to stabilize the financial panic. It is noteworthy that the size of

978-0-226-26034-1/2012/2011-0060$10.00

Table 1
Discretionary Fiscal Stimulus in 2009–2011

		Crisis Fiscal Stimulus/GDP (%)			Financial Sector Bailout (2009–2011, %GDP)		Depreciation 2009–2010 (%)
Country		2009	2010	(Expected) 2011	Pledged	Net Cost	Cumulative
Industrial countries	Australia*	2.7	1.7	1.3	.0	–.1	–8.6
	Canada*	1.8	1.7	.0	9.1	4.4	–15.6
	France*	1.2	1.1	.6	1.5	.3	2.4
	Germany*	1.7	2.2	1.7	1.8	1.7	2.4
	Japan*	2.8	2.2	1.1	6.6	.1	–15.1
	Norway	1.2	.	.	.	.	7.1
	Sweden	1.4	.	.	.	.	9.4
	Switzerland	.6	.	.	.	.	–3.7
	United Kingdom*	1.6	.0	.0	11.9	6.1	19.0
	United States*	1.8	3.8	.	7.4	3.4	–2.3
Euro area	Austria	1.5	.3	.	.	.	2.4
	Belgium	1.0	.	.	4.3	4.1	2.4
	Denmark	1.9	3.1	.	.	.	1.3
	Finland	3.3	.	.	.	.	2.4
	Greece*	.	–2.2	.	5.1	5.0	2.4
	Ireland*	.	–3.5	.	3.0	28.7	2.4
	Italy*	.0	.0	.	1.3	.3	2.4
	Netherlands	1.4	.	.	14.4	6.0	2.4
	Portugal*	1.3	–3.0	.	.	.	2.4
	Spain*	3.7	.	.	2.9	2.0	2.4

Emerging markets	Argentina*	4.7	1.4	.	.0	.	23.9
	Brazil*	.7	.6	.0	.8	.	–4.1
	China*	3.1	2.7	.	.0	.	–2.6
	Czech Republic	1.6	.	.	.0	.	11.9
	India*	.5	.3	.0	.0	.	–5.6
	Indonesia*	1.4	.0	.2	.0	.	–6.2
	Mexico*	1.5	1.0	.0	.0	.	13.5
	Russia*	4.5	5.3	4.7	7.7	.	22.2
	Saudi Arabia*	5.4	4.2	1.6	.0	.	–2.3
	South Africa*	3.0	2.1	.0	.0	.	–11.4
	South Korea*	3.6	1.1	.0	2.7	.1	4.9
	Turkey*	1.2	.5	.0	.0	.	15.5

Source: IMF Public Information Notice.
*Fiscal Monitor (2010 November, 2011 January, April).
Dots denote "Not applicable (no fiscal stimulus)."

the transfers to the financial system exceeded the direct fiscal stimuli in Germany and the United Kingdom. Similar trends, though in varying intensity, were observed in other OECD countries.

China, South Korea, and Russia provided front loaded fiscal stimulus at rates that were well above that observed in most OECD countries. Notable is the greater agility of the emerging markets' response relative to that of the OECD countries, reflecting possibly faster policy response capacity of several emerging markets. The deeper safety net of the OECD (unemployment insurance, food stamps, social security, socialized medical care, etc.) provides automatic stabilizers that work to cushion the economy in addition to the crisis-related stimulus. Dolls, Fuest, and Peichl (2010) reported,

> We find that automatic stabilizers absorb 38 per cent of a proportional income shock in the EU, compared to 32 per cent in the U.S. In the case of an unemployment shock 47 percent of the shock are absorbed in the EU, compared to 34 per cent in the U.S. This cushioning of disposable income leads to a demand stabilization of up to 30 per cent in the EU and up to 20 per cent in the U.S. There is large heterogeneity within the EU. Automatic stabilizers in Eastern and Southern Europe are much lower than in Central and Northern European countries. (1)

In contrast, emerging markets with a more limited safety net but with larger fiscal space tend to benefit by a more aggressive crisis-related fiscal stimulus, compensating partially for the absence of deeper social insurance.

In this paper we study the response heterogeneity of countries during the crisis, indentifying the associations of economic structure (trade openness, fiscal capacity, etc.), the size of fiscal stimuli, and the exchange rate depreciations during the crisis. A useful theoretical anchor predicting such heterogeneity is the neo-Keynesian open economy, as predicted by the Meade's (1951a, 1951b) framework. The textbook Meade model implies that at times of collapsing aggregate demand, economies that are more closed (or less open) should opt for a larger fiscal stimulus and should opt for larger fiscal stimuli, and should rely less on exchange rate depreciation (e.g., Blanchard 2008).[1] Trade openness implies lower fiscal multipliers, as a share of the stimuli would "leak." Trade openness may also increase the relative potency of exchange rate depreciation (relative to the fiscal stimulus) in mitigating the drop in demand for exportable goods, acting as a demand switching policy, whereby the improved competitiveness of a country increases the demand for net exports.[2]

Fiscal policy is predicated on fiscal space and fiscal capacities. While the notion of fiscal space is fuzzy, it deals with the degree to which a country has the ability to fund a fiscal stimulus without a sizable increase in the real interest rate.[3] The presumption is that public debt overhang (like higher public debt/GDP) reduces the ability to fund fiscal stimuli. Indeed, public debt/GDP has been frequently used by the literature and by policymakers as an important indicator for the soundness of policies, and as a measure of exposure to confidence crises. Reinhart and Rogoff (2010) warned that debt-to-GDP ratios over 90% are associated with lower growth.[4] Similarly, the Maastricht criteria imposed thresholds of public debt/GDP below 60%, and fiscal deficit/GDP below 3% as criteria for joining the Euro.

While these ratios are easy to track, we question the degree to which the normalization of public debt and fiscal deficit by the GDP is an efficient way of comparing and measuring fiscal capacities across countries and across time. A given ratio of the public debt/GDP, say 60%, is consistent with ample fiscal space in countries where the average tax collection is about or above 50% of the GDP, as is the case in France, Germany, and in most northern European countries. The same public debt ratio is associated with a limited fiscal space in countries where the average tax collection is about or below 25%, as has been the case in developing countries, emerging markets, and the South-Western Euro Area Peripheral (SWEAP) countries (Greece, Ireland, Italy, Portugal, and Spain). Instead of a normalization of public debt and fiscal deficit by the GDP, we contend that the tax revenue as a share of the GDP, averaged across the business cycle, provides a more efficient way of normalizing macro public finance data.

Specifically, we point out that the tax collection/GDP, averaged to smooth for business cycle fluctuations, provides key information on the availability of the tax revenue to support fiscal policy. We define this ratio as the (de facto) tax base: short of a drastic change in tax rates and tax enforcement, the tax base provides a concise summary of the tax capability. The (de facto) tax base reflects both the ability and the willingness of a country to fund fiscal expenditure and transfers. Across countries, we find that the de facto tax base is more stable than public debt/GDP, and public debt/GDP normalized by the de facto tax base is more volatile than public debt/GDP (see the coefficient of variations reported at the bottom of table 3). The public debt/GDP normalized by the de facto tax base is subject to greater cross country variation, and provides a more robust explanation for the scale of fiscal stimuli. Es-

sentially, the public debt/GDP normalized by the de facto tax base measures the average tax years that it would take to "buy" the outstanding public debt, and provides a stock measure of public debt overhang. We view this measure as a more fundamental metric for fiscal space, as it links the public debt to the resources the public sector can mobilize without drastic change of the social contract. Consequently, we define the de facto fiscal space by the inverse of the average tax-years it would take to repay the public debt.

It is noteworthy that if changing government expenditure and taxes are equally costly, our focus on de facto fiscal space would be questionable. For example, a high level of tax revenue could be interpreted as leaving little room to raise taxes, thus counting negatively toward fiscal space, unlike our interpretation. Our presumption is that the costs of changing the tax rates and their enforcement are high relative to the lower political costs of changing the public debt/GDP and the fiscal deficit/GDP. Thus, the tax base depends on structural factors that are harder to modify in the short run than adjusting government expenditure. This view is consistent with recent empirical literature finding that tax compliance and individuals' willingness to pay taxes is affected by perceptions about the fairness of the tax structure. An individual taxpayer is influenced strongly by his perception of the behavior of other taxpayers (see Alm and Torgler 2006 and the references therein). If taxpayers perceive that their preferences are adequately represented and they are supplied with public goods, their identification with the state increases, and thus the willingness to pay taxes rises (Frey and Torgler 2007). In a follow-up work (Aizenman and Jinjarak 2011), we studied the relationship between the tax base and income inequality. We found that the Gini coefficient is negatively associated with the size of the tax base/GDP. This implies that changing taxes may be difficult in polarized countries. While all these factors are endogenous in the long run, they are mostly predetermined in the short run—the time that the policymaker determines in an unanticipated recession the implementation of fiscal stimuli. In a companion paper, we also study the usefulness of the de facto fiscal space measures by showing that they account better for sovereign spreads of countries than the more conventional public debt/GDP (Aizenman, Hutchison, and Jinjarak 2011).[5]

We use the precrisis de facto fiscal space and structural controls to account for the patterns of fiscal stimuli and exchange rate adjustments during the crisis, validating the predictions of the Mundell-Fleming (MF) approach. We find that higher public debt/average tax base is associated

with lower fiscal stimulus, and greater trade openness is robustly associated with a lower fiscal stimulus and a higher depreciation rate during the crisis. A one standard deviation increase of the public debt/average tax base lowers the size of the fiscal stimulus by about 2% of the GDP. A one standard deviation increase of trade openness increases the nominal depreciation during 2007–2009 by about 7 percentage points.

Section II reviews the heterogeneity of the fiscal stimulus and of the exchange rate adjustment during the crisis window. We also investigate the patterns of de facto fiscal capacities in 123 countries, a sample chosen by data availability. Section III overviews selectively the literature on fiscal multipliers. Section IV applies the precrisis de facto fiscal space measures and other controls in a regression framework, accounting for the heterogeneity of the fiscal stimuli and of the exchange rate adjustments during the crisis. We also describe in this section the relevance of the de facto fiscal space in explaining sovereign spreads. Section V concludes.

II. Assessment of the De Facto Fiscal Space Prior to the Crisis (2006)

Insight regarding fiscal space is provided by tracing the precrisis 2006 public debt/GDP as a fraction of the precrisis average tax revenue/GDP during 2000–2005. To recall, the early 2000s were viewed as the continuation of the blissful "Great Moderation"—a period characterized by a drop in macroeconomic volatility and risk premium during the late 1990s and early 2000s.[6] The precrisis average tax revenue/GDP measures the de facto tax capacity in years of relative tranquility.

The top half of figure 1 reports the average tax-years needed to repay the public debt measure of 123 countries, subject to data availability in 2006. We obtain this measure by dividing the public debt/GDP in 2006 by the average tax revenue/GDP during 2000–2005. It shows the wide variation in the average tax-years needed to repay the public debt, from well below one year in Australia (indicating a high fiscal space), to about five years in Argentina, and above eight years in Bhutan (indicating a very low fiscal space). For most of the countries in our sample, the tax-years it would take to repay the public debt in 2006 were below five years. The bottom half of figure 1 reports another measure of fiscal tightness, focusing on flows instead of stocks (i.e., on fiscal deficits instead of public debt): the fiscal deficits/GDP in 2006 relative to the average tax revenue/GDP.

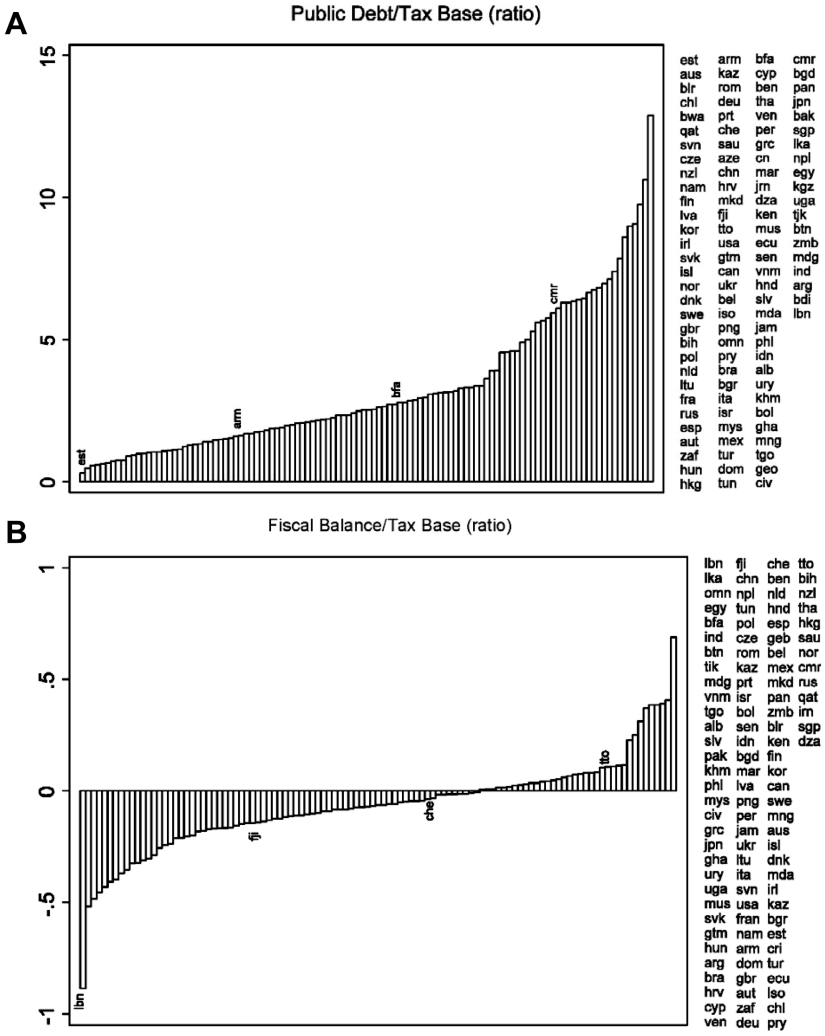

Fig. 1. Fiscal space by country in 2006

Notes: *A*, the fiscal space is calculated from public debt as of 2006 and 2000–2005 average tax/GDP; *B*, the fiscal space is calculated from fiscal balance as of 2006 and 2000–2005 average tax/GDP.

Figure 1 is consistent with the notion that, even without increasing the tax base, a fair share of countries had significant fiscal space in 2006.[7] The presumption is that a *lower* precrisis public debt/GDP relative to the precrisis tax base (i.e., higher de facto fiscal space) implies *greater* willingness to fund fiscal stimuli using the existing tax capacity.

We apply these concepts in order to explain the cross-country variation in the fiscal stimulus during the aftermath of the global crisis.

To track the adjustment of fiscal capacity across countries, the top half of figure 2 also reports our main fiscal space measure, the debt/GDP normalized by the average tax revenue/GDP, by country groups. Lower precrisis public debt/GDP, lower public debt/average tax base, and lower fiscal deficits relative to the average tax base imply greater fiscal capacity. The figure shows that fiscal space was weakest (highest levels of public debt/average tax base) in the low and middle-income countries. Although fiscal space measures are stronger in the SWEAP countries than in low- and middle-income countries, its debt/GDP ratio is higher. Generally, the SWEAP countries had more limited fiscal space during the tranquil period than other OECD countries—higher average public debt relative to the tax base, and a higher level of public debt to GDP. The lower panel of figure 2 provides similar measures of the fiscal deficit/GDP and fiscal deficit/tax base.

Some developments of the debt/tax base after 2006 are worth mentioning. High-income OECD and non-SWEAP Euro countries experienced an increase in the debt/tax base ratios of about 0.2 between 2006 and 2010. For SWEAP countries, the deterioration in fiscal circumstances was dramatic: the government debt of Ireland climbed from 25% of GDP in 2007 to 93% of GDP in 2010, while the government debt of Greece went from 95% to 130% of GDP. As a result, the public debt/average tax base ratio of Ireland jumped from 0.9 to 3.1, and that of Greece from 3.0 to 4.1, sharply diminishing their ability to conduct a discretionary fiscal policy. The large increase of the debt/tax base ratios in both countries captures a high degree of distress in their economic fundamentals, and the socialization of private banks' liabilities in Ireland.

Figure 3 provides the histograms of the average tax collection/GDP, public debt/GDP, public debt/GDP moralized by the average tax base, and the fiscal balance/average tax base of countries in the sample, based on public debt and the fiscal balance of 2006, and the average tax base of 2000–2005. The top left panel of the figure shows that the distribution of the tax base is tri-modal, approximately at 15, 25, and 35% of GDP. The top right panel suggests the average public debt of 50 to 60% of GDP. The bottom left panel shows that most of the public debt/average tax base observations are well below five, with the majority around two. The fiscal balance/average tax base in the bottom right panel indicates that this variable is approximately centered around zero.

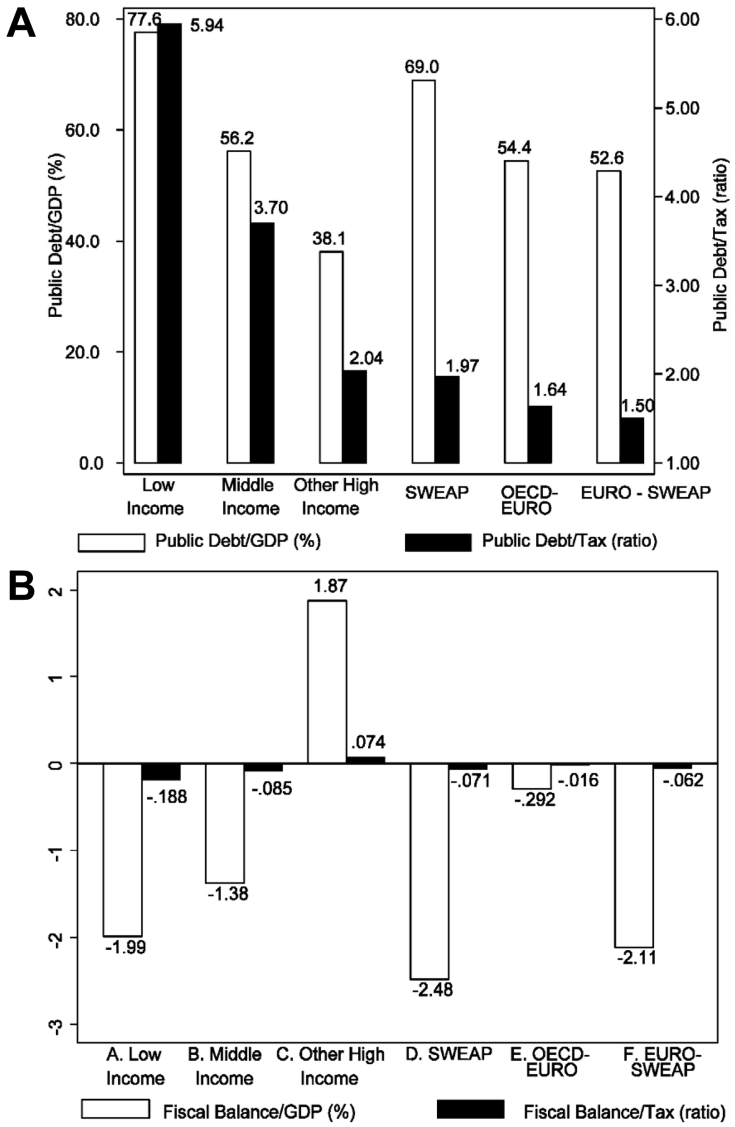

Fig. 2. Average 2000–2006 fiscal space by region

Notes: *A*, the fiscal space is calculated from public debt as of 2006 and 2000–2005 average tax/GDP. SWEAP includes Greece, Ireland, Italy, Portugal, and Spain. *B*, the fiscal space is calculated from fiscal balance as of 2006 and 2000–2005 average tax/GDP.

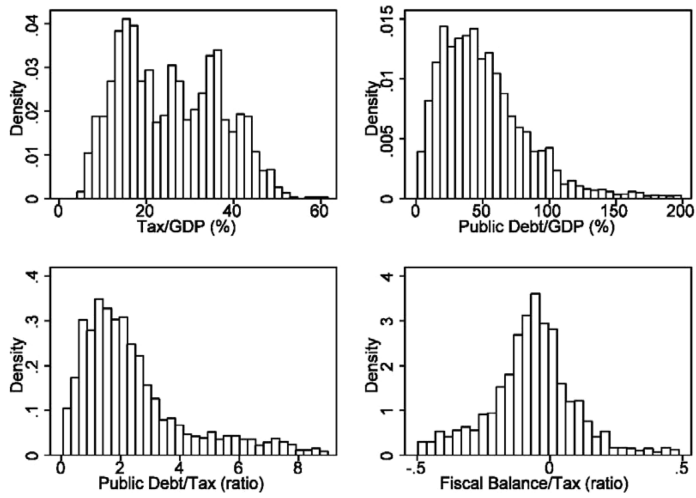

Fig. 3. Histograms of fiscal space 2006

Note: The fiscal space is calculated from public debt and fiscal balance as of 2006 and 2000–2005 average tax/GDP.

We conduct first a descriptive analysis of the between-period stability for the key variables in table 2. Specifically, we are interested in the relative stickiness of the average tax/GDP, public debt/GDP, and the public debt/average tax base between the 1993–1999 and the 2000–2006 periods, within each country in the sample. To have a representative comparison, we do this exercise for countries with at least three years of observations in both periods; this leaves us with 80 countries. We calculate the mean of these variables for each period, perform a *t*-test for each country, and report the significant (5%) results by country groups as well as the total. The total number of countries with a significant change of the average tax base/GDP over the decades is 66, slightly larger than the number of countries with a significant change of public debt/GDP, 58. A majority of countries sees a drop of average tax base/GDP (34 decline versus 29 increase), while the number of increases and decreases of the public debt/GDP are not as markedly different. In total, within country over the decade, the public debt/average tax base is more volatile than the public debt/GDP.

Table 3 provides the mean, standard deviation, median, and coefficient of variation for the same sample of 80 countries. The mean tax base is 24% of GDP, while the mean public debt is 60% of GDP. The mean public debt is 300% of the average tax base (3 tax years). The

Table 2
Stability Test of Fiscal Space

Variable	Lagged 5-yr Moving Avg. Tax/GDP (%)				Public Debt/GDP (%)				Public Debt/Tax (%)			
	Change: 1993–1999 vs. 2000–2006				Change: 1993–1999 vs. 2000–2006				Change: 1993–1999 vs. 2000–2006			
Country group	Mean Change	No. of Countries *t*-tested	No. of Sig. Increase	No. of Sig. Decrease	Mean Change	No. of Countries *t*-tested	No. of Sig. Increase	No. of Sig. Decrease	Mean Change	No. of Countries *t*-tested	No. of Sig. Increase	No. of Sig. Decrease
A. Low income	.1	7	2	2	–9.2	7	1	2	–62.7	7	2	3
B. Middle income	.0	36	11	20	–1.8	36	13	11	–9.2	36	18	9
C. Other high income	–.3	7	0	4	–1.1	7	3	3	–6.3	7	3	2
D. SWEAP	.0	5	4	1	–1.3	5	0	3	–4.5	5	0	5
E. OECD–EURO	.0	16	9	6	.1	16	4	10	1.0	16	3	9
F. EURO–SWEAP	.1	9	6	1	–.2	9	4	4	–.9	9	3	6
All countries	.1	80	32	34	–.9	80	25	33	–6.0	80	29	34
Total no. of sig.			*66*				*58*				*63*	

Notes: The fiscal space is calculated from public debt as of 2006 and 2000–2005 average tax/GDP. The South-Western Euro Area Peripheral (SWEAP) includes Greece, Ireland, Italy, Portugal, and Spain.

Table 3
Mean and Dispersion of Fiscal Space Components

Period	Countries	Mean	Standard Deviation	Median	Coefficient of Variation
			Tax/GDP (%)		
1993–1999	80	23.98	11.11	20.05	.46
2000–2006	80	23.94	11.48	21.37	.48
1993–2006	80	23.96	11.26	20.33	.47
			Public Debt/GDP (%)		
1993–1999	80	60.79	34.19	55.38	.56
2000–2006	80	58.18	32.85	53.45	.56
1993–2006	80	59.49	33.45	55.16	.56
			Public Debt/Tax (%)		
1993–1999	80	314.87	234.05	246.75	.74
2000–2006	80	302.76	226.83	233.37	.75
1993–2006	80	308.82	229.83	239.69	.74

Note: The fiscal space is calculated from public debt as of 2006 and 2000–2005 average tax/GDP.

cross-country coefficient of variation confirms that the public debt/average tax base is subject to a sizably greater variation than the public debt/GDP (0.74 versus 0.56).

III. Fiscal Multipliers in the Open Economy—Literature Overview

Before turning to the regression analysis, we place the paper in the context of the evolving literature on fiscal policy at times of distress. Textbook analysis of fiscal stimulus in a closed economy suggests that an increase in government expenditure on goods and services in a closed economy would deliver a greater beneficial stimulus if

It would not crowd out private sector activities.

It would not increase interest rates, and would not raise concerns about the future fiscal and monetary stability of the country.

It would target projects with high social marginal product, and would take place before the onset of the recovery, contributing thereby toward shortening the recession.

Fiscal stimulus in an open economy involves further considerations, as the incipient appreciation under a flexible exchange rate with capital

mobility may induce crowding out of export demand. Under a fixed exchange rate with capital mobility, fiscal policy tends to involve positive spillover effects, inducing higher demand for imports and incipient monetary expansion. These considerations imply that, at times of global recession, a properly coordinated fiscal expansion would mitigate most exchange rate appreciation concerns, inducing mutually reinforcing positive spillover effects that increase the ultimate stimulus. Similar considerations apply to a fiscal stimulus in the form of transfer income.

Fiscal skeptics worry frequently about crowding out, and the growing costs of a prolonged fiscal stimulus. As there is no way to conduct controlled experiments regarding these key issues, views about the size of fiscal multipliers diverge. Conventional wisdom has been that developing countries have limited fiscal space—their limited tax capacity and possibly sizable debt overhang imply that a fiscal stimulus may backfire by increasing the interest rate and the risk premium facing the country, inducing down the road an Argentinean vintage 2000–2002 type funding crisis. The deeper taxation capacity of the OECD countries suggests wider fiscal space. However, the growing debt overhang associated with lucrative safety nets, unfunded liabilities, aging population, and demographic transitions may crowd out most of the fiscal space of OECD countries. These considerations suggest that, while a short-term fiscal stimulus following a deep crisis would be supported by most OECD countries, a prolonged fiscal stimulus would induce a vigorous debate that probably would constrain policymakers. These dynamics have been played out vividly in the years following the 2008–2009 global crisis.

The literature pointed out the difficulty in calculating the net fiscal multipliers, as there is no simple way to control the "fiscal experiment." The estimates of the fiscal multipliers vary, depending on the methodology, period, and controls applied (see Barro and Redlick 2009; Christiano, Eichenbaum, and Rebelo 2009). More recent work found that the size of the multiplier varies considerably over the business cycle: between 0 and 0.5 in expansions and between 1 and 1.5 in recessions (see Auerbach and Gorodnichenko 2010). Applying the history of the United States during World War II, Gordon and Kerrn (2010) inferred that when capacity constraints are absent across the economy, the fiscal multiplier is about 1.8, higher than most previous estimates. While useful, these studies focused mostly on the experience of the United States and the OECD countries. Ilzetzki, Mendoza, and Végh (2010) asked related questions applying relatively comprehensive quarterly data, covering

20 high-income and 24 developing countries. Using the variation offered by this rich data, they estimated fiscal multipliers for different groups of countries. They found that the economies operating under predetermined exchange rate regimes have long-run multipliers that are relatively large (higher than one), but economies with flexible exchange rate regimes have essentially zero multipliers. The response of central banks to fiscal shocks is crucial in assessing the size of fiscal multipliers. Economies that are relatively closed to trade have long-run multipliers exceeding one, but relatively open economies have negative multipliers. A high outstanding debt of the central government (exceeding 60% of GDP) was associated with zero short-term and negative long-term fiscal multipliers. Sovereign debt ratios above 60% of GDP were associated with negative long-run effects of fiscal stimulus.

The Ilzetzki et al. (2010) results are consistent with the neo-Keynesian open economy framework, allowing for the complications associated with partial financial integration due to sovereign risk, and the limited substitutability of domestic and foreign assets. The adverse effects of a fiscal stimulus under a flexible exchange rate are consistent with the crowding out of aggregate demand associated with a fiscal stimulus in economies close to full employment, or without the proper accommodation of monetary policy. Similarly, the adverse effects of trade openness on the fiscal multiplier are in line with the neo-Keynesian open economy "linkage channel." While the Ilzetzki et al. (2010) sample period ends before the crisis, their results suggest that during the global crisis of 2008–2009, countries with lower debt overhang, lower inflation, and lower trade openness would have benefited more by a sizable fiscal stimulus. A lower debt overhang should mitigate the adverse impact of debt financing on the interest rate. Lower inflation would allow greater monetary accommodation to mitigate any crowding out effects. Smaller trade openness would increase the domestic impact of a given fiscal stimulus. While at times of full employment a fiscal stimulus under a flexible exchange rate induces appreciation, during the global crisis of 2008–2009, the deleveraging propagated by the United States led to depreciation pressures that impacted most countries. The collapsing global demand mitigated most inflationary concerns related to depreciation, tilting the balance toward a greater willingness to depreciate in order to improve competitiveness.

These considerations suggest that during the crisis of 2008–2009, closer economies, or countries with greater fiscal space, would opt for a larger fiscal stimulus. Opener countries or countries with more limited

fiscal space would opt for a smaller fiscal stimulus and larger exchange rate depreciation. We turn now to empirical tests of these and related hypotheses. We test the degree to which the cross-country variation in actual fiscal stimuli confirms the predictions of the MF framework.

IV. Fiscal Space, Exchange Rate Adjustment, and Fiscal Stimuli

We apply both public debt/GDP and public debt/GDP normalized by the average tax base concepts in order to explain the cross-country variation in the fiscal stimulus during the aftermath of the global crisis. Recall that figure 2 suggests that in 2006, the middle-income countries' fiscal space was higher than that of the low-income countries. While the precrisis debt overhangs (i.e., the 2006 public debt/GDP) of the low and lower middle income countries were slightly above the other groups, their ratios of the public debt/GDP to the average tax base were much higher than that of most the OECD countries (5.94, 3.70, and about 1.5, respectively). This in turn implies that the low- and middle-income countries have had smaller fiscal space than most Organization of the Petroleum Exporting Countries (OPEC). Consequently, the fiscal stimuli of the richer countries would have the side benefit of helping the poorer countries in invigorating the demands facing lower income countries.

Based on data availability of 123 countries, we present in table 4 the regression analysis, accounting for the cross-country variation in the fiscal stimulus during 2009–2011. The explanatory variables are the public debt/GDP and the de facto fiscal space. We begin with these two explanatory variables in the simple ordinary least squares (OLS) estimation in columns (1) and (2). The OLS results show that neither public debt/GDP nor public debt normalized by the average tax base can explain the size of fiscal stimuli. Since there are only 30 or so countries that have a nonzero fiscal stimulus, the OLS method may not be appropriate.

Next we conduct the Tobit estimation (left censoring at zero fiscal stimulus). To account for a potential correlation among countries in each income group, the cross-section estimation is done by clustering at income group levels (according to the World Bank's income classification). The results in columns (3) and (4) of table 4 indicate that a higher public debt/average tax base is negatively and significantly associated with the size of the fiscal stimuli, whereas the public debt/GDP is not. Lowering the 2006 public debt/average tax base from the average level of low-income countries (5.94) down to the average level of the Euro–

Table 4
Fiscal Stimulus and Financial Bailouts of 2009–2010 and Fiscal Space of 2006

	Crisis Fiscal Stimulus %GDP				Pledged Financial Sector Bailout %GDP			
	OLS		Tobit, Censoring at 0 Stimulus		OLS		Tobit, Censoring at 0 Stimulus	
	Coeff. (s.e.) (1)	Coeff. (s.e.) (2)	Coeff. (s.e.) (3)	Coeff. (s.e.) (4)	Coeff. (s.e.) (5)	Coeff. (s.e.) (6)	Coeff. (s.e.) (7)	Coeff. (s.e.) (8)
Debt %GDP	–.000		.002		.001		.067	
	(.005)		(.021)		(.008)		(.067)	
Debt %Tax		–.001		–.006**		–.002**		–.030**
		(.001)		(.003)		(.001)		(.015)
_sigma			5.647***	5.498***			16.094***	15.051***
			(.900)	(.872)			(3.567)	(3.289)
constant	.725**	1.046***	–4.265**	–2.138*	.906	1.731**	–22.889***	–9.391*
	(.358)	(.336)	(1.631)	(1.240)	(.677)	(.672)	(7.364)	(4.878)
R^2	.0000	.0158	.0000	.0186	.00005	.0266	.0058	.0343
Countries	123	123	123	123	123	123	123	123
Lowering 2000–2006 Debt/Tax ratio from the average level of low-income countries (5.94) down to the average level of the Euro (SWEAP) countries (1.97) ≡ increasing approximately a size of stimulus %GDP in 2009–2011 by				2.78				

Note: The fiscal space is calculated from public debt as of 2006 and 2000–2005 average tax/GDP. Standard errors are in parentheses.
* Significant at the 10% level.
** Significant at the 5 % level.
*** Significant at the 1% level.

SWEAP countries (1.97) increases the crisis stimulus in 2009–2011 by 2.78 GDP percentage points. However, studying the size of the pledged financial sector bailouts relative to GDP, we find that public debt/GDP (and not public debt/tax base) is positively and significantly associated with the size of financial bailouts. While the sign of the coefficient estimates is sensible for the public debt/tax base and counterintuitive for the public debt/GDP, the baseline regression can be improved by dealing with omitted variable biases, and with concerns that the public debt/tax base and the public debt/GDP are endogenous to other variables.

Table 5 explains the size of fiscal stimuli using a larger set of variables. To account for the political capacity and for the role of fiscal policy in the open economy, columns (9) and (10) report the Tobit estimation with the state fragility variable[8] and trade openness/GDP. The effects of the public debt/average tax base and the public debt/GDP are similar to those in table 4. In addition, the size of the fiscal stimuli is negatively and significantly associated with the state fragility and trade openness/GDP. That is, stronger states and closer economies have applied a larger fiscal stimulus during 2009–2011.

Columns (13) and (15) report regression results where public debt/average tax base and public debt/GDP are instrumented by lagged economic fundamentals. These fundamentals are trade openness, financial openness, real GDP per capita, growth rate of total real GDP, government share of real GDP per capita, and legal origins.[9] For example, in equation (15), the public debt/average tax base (Debt %Tax) is the endogenous regressor, instrumented by variables in equation (16). These regressions also have a decent explanatory power, accounting for about 23% of the variations across countries in the public debt/GDP, and about 38% in the public debt/tax base. The coefficient of the instrumented public debt/GDP in (13) has a negative sign, so does the coefficient of the instrumented public debt/tax base. Both the public debt/tax base and the public debt/GDP are statistically significant at the 1% level.

The bottom half of table 5 reports regressions studying jointly the size of fiscal stimuli and the size of financial bailouts. To account for a possible sample selection bias, we first run the probit estimation of the fiscal stimulus on the instrumented public debt/GDP, on state fragility, and on trade openness (column [17]), and similarly for the financial bailout in column (18). Then we estimate the seemingly unrelated regression of fiscal stimuli and financial bailout as dependent variables

Table 5
Robustness Check: Fiscal Stimulus and Financial Bailouts of 2009–2010 and Fiscal Space of 2006

A	Crisis Fiscal Stimulus %GDP		Pledged Financial Sector Bailout %GDP		Crisis Fiscal Stimulus %GDP			
	Tobit, Censoring at 0 Stimulus		Tobit, Censoring at 0 Stimulus		Endogenous Regressor Tobit, Censoring at 0 Stimulus			
	Coeff. (s.e.) (9)	Coeff. (s.e.) (10)	Coeff. (s.e.) (11)	Coeff. (s.e.) (12)	Coeff. (s.e.) (13)	Coeff. (s.e.) (14)	Coeff. (s.e.) (15)	Coeff. (s.e.) (16)
Debt %GDP	.002		.069		−.032	Y = Debt %GDP		Y = Debt %Tax
	(.019)		(.069)		(.045)			
Debt %Tax		−.004		−.009			−.026**	
		(.003)		(.015)			(.011)	
State fragility	−.560***	−.474***	−2.332**	−2.206**	−.312**		.151	
	(.145)	(.152)	(.960)	(1.014)	(.128)		(.297)	
Trade openness %GDP	−.082***	−.088***	−.067	−.091	−.060***	−.048	−.071***	−.119
	(.023)	(.023)	(.056)	(.064)	(.019)	(.082)	(.023)	(.633)
Financial openness			1.598	2.068		4.987*		30.863*
			(2.280)	(2.290)		(2.817)		(15.826)
Real GDP per capita						−9.595***		−137.220***
						(3.582)		(21.297)
Growth rate of total real GDP						−3.569***		−9.827
						(1.266)		(7.395)
Government share of real GDP per capita						1.028		4.106
						(.665)		(5.996)
English legal origin						13.317*		88.458**
						(7.435)		(43.800)
French legal origin						7.395		77.441
						(7.845)		(47.242)
German legal origin						1.337		9.774
						(10.129)		(51.360)
R^2	.13303	.13969	.15148	.14848		.22583		.37958
Countries	112	112	112	112	112		112	

(*continued*)

Table 5
Continued

B	Endogenous Regressor Probit		Seemingly Unrelated Regression (SUR)		Endogenous Regressor Probit		Seemingly Unrelated Regression (SUR)	
	Stimulus	Bailout	Stimulus	Bailout	Stimulus	Bailout	Stimulus	Bailout
	Coeff. (s.e.) (17)	Coeff. (s.e.) (18)	Coeff. (s.e.) (19)	Coeff. (s.e.)	Coeff. (s.e.) (20)	Coeff. (s.e.) (21)	Coeff. (s.e.) (22)	Coeff. (s.e.)
Instrumented debt %GDP	−.015	.031***	−.066***	.019				
	(.013)	(.007)	(.022)	(.033)				
Instrumented debt %Tax					−.004***	−.005***	−.007***	.011
					(.001)	(.000)	(.002)	(.011)
State fragility	−.126**	−.182***	.049		.008	.046	.088	
	(.064)	(.064)	(.070)		(.047)	(.055)	(.057)	
Trade openness %GDP	−.015**	−.007	−.010*		−.009**	−.003	−.012***	
	(.006)	(.006)	(.005)		(.004)	(.003)	(.004)	
Financial openness				.056				−.128
				(.335)				(.455)
Real GDP per capita				1.223**				2.578*
				(.528)				(1.510)

Growth rate of total				−.278***						−.102		
Real GDP				(.107)						(.068)		
Government share of real				.093*						.047		
GDP per capita				(.056)						(.050)		
English legal origin					4.014**						3.366*	
					(1.711)						(1.847)	
French legal origin					3.107*						2.539	
					(1.662)						(1.766)	
German legal origin					2.600						2.557	
					(1.735)						(1.736)	
Probability of a positive				1.469	1.244					.237	.063	
outcome (from probit)				(1.449)	(1.601)					(.946)	(1.641)	
R^2				.19370	.18223					.22515	.17821	
Countries	112	112		112		112		112		112		

Notes: Standard errors are in parentheses. (A) The fiscal space is calculated from public debt as of 2006 and 2000–2005 average tax/GDP. In equation (15), Debt %Tax is the endogenous regressor, instrumented by equation (16). (B) This panel reports estimation of two stages: first, the incidence of stimulus and bailout via Probit; second, their size across countries via SUR. The fiscal space is calculated from public debt as of 2006 and 2000–2005 average tax/GDP. Probability of a positive outcome included in SUR is estimated from the probit regression of a stimulus incidence (1 if stimulus; 0 if none) on fiscal space, state fragility, and trade openness.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

(columns [19] and [22]). The results indicate that, when both variables are explained jointly, the size of fiscal stimuli can be explained by either the public debt/GDP or the public debt/tax base. Yet, the financial bailouts are not explained well by these variables.

We can now provide the economic significance of the public debt/GDP and the public debt/tax base in the cross-country estimates, regressions (19) and (22) of table 5. For each explanatory variable, we multiply its standard deviation with the estimated coefficient in the regression to approximate the effect of its one standard deviation change on the size of the fiscal stimulus. The calculation suggests that the size of the stimulus in 2009–2011 is larger in countries with larger de facto fiscal space and lower trade/GDP. A decrease in the public debt/average tax base revenue by one standard deviation (248% of GDP) implies, all other things being equal, an increase of the fiscal stimulus during 2009–2011 by $.009 \cdot 248 = 2.232\%$ of GDP.

To gauge the role of exchange rate adjustment, figures 4 and 5 report the marginal impact of one standard deviation change of the public debt/tax base, the public debt/GDP, and the trade/GDP on the size of fiscal stimulus. In both figures, we provide also the realized depreciation. Figure 4 reports the effects of fiscal space and trade openness on the fiscal stimulus size *by* country groups categorized by the magnitude of exchange rate adjustment during 2007–2009, whereas figure 5 reports these effects by income groups. In figure 4, for the first group (59 countries), their exchange rates appreciated in the range of –21.8, 0.0, where negative means appreciation. For the second and third groups (27 and 26 countries in each, respectively), their exchange rates depreciated in the range of .03, 10.1 and 10.5, 94.9, respectively. For the third group (largest depreciation countries), a one standard deviation increase of debt/tax base (Debt %Tax base) lowers the size of fiscal stimulus by 2.79% of the GDP—the effect that is larger than 2.46% of the GDP on the stimulus of the first group (appreciation countries), as well as 1.94% of GDP of the second group (moderate depreciation). Consequently, countries displaying higher depreciation during 2007–2009 were also subject to a larger negative economic effect of their debt/tax base on the size of fiscal stimulus. This is consistent with substitutability between fiscal space and depreciations. However, when countries are ordered by their income groups, as shown in figure 5, it is less clear whether the fiscal stimulus and the realized exchange rate adjustments are substitutes or complements.

Since the fiscal stimuli and the exchange rate adjustments may be de-

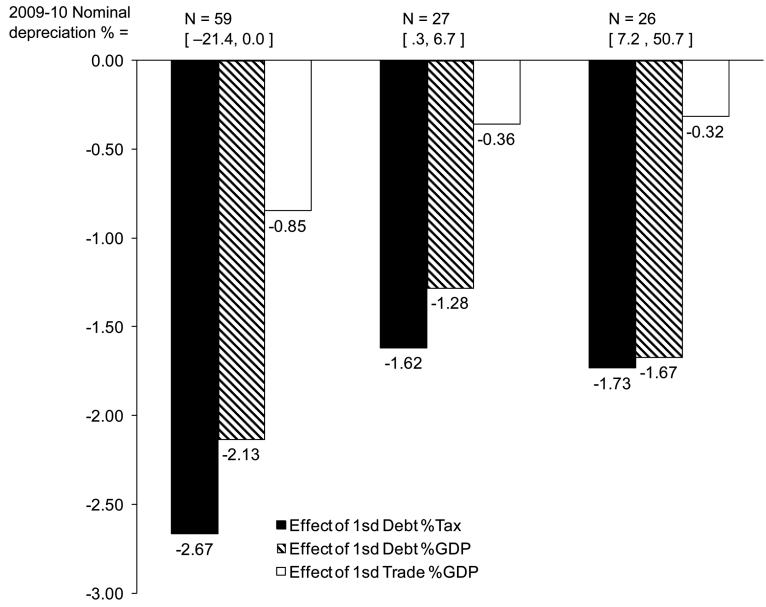

Fig. 4. Economic significance on the size of crisis fiscal stimulus %GDP, whole sample
Notes: We categorize countries into three groups. For the first group (59 countries), their exchange rates did appreciate from Jan. 2009 to Dec. 2010 in the range of –21.4, 0.0%. For the second and third groups (27 and 26 countries), the exchange rates depreciated cumulatively in the range of .3, 6.7% and 7.2, 50.7%, respectively. This figure reports the economic effects of a one standard deviation increase in Debt/GDP (equation [19]), Debt/Tax base (equation [22]), and Trade/GDP (average of equations [19] and [22]) on the size of fiscal stimulus of 2009–2010. For the third group (largest realized depreciation countries), a one standard deviation increase of debt %tax base lowers the stimulus by 1.67% GDP.

termined by some common factors, it is important to study them jointly. Panel A of table 6 estimates these two dependent variables simultaneously. The table reports the cross-country singularly unrelated regresssions (SUR) estimation results with the size of stimulus (or bailout) and depreciation as the two dependent variables. Because the explanatory variable set cannot be the same for both dependent variables in the SUR, we adjust some variables accordingly. Positive depreciation (0/1) variable is a dummy variable equal to 1 if the exchange rate depreciated cumulatively from January 2007 to December 2009. Euro countries (0/1) variable is a dummy variable equal to 1 if a country is a member of the Eurozone. Probability of a positive outcome is estimated from the probit regression of a stimulus incidence (1 if stimulus, 0 if none) on fiscal space, state fragility, and trade openness. Column (25) focuses on the

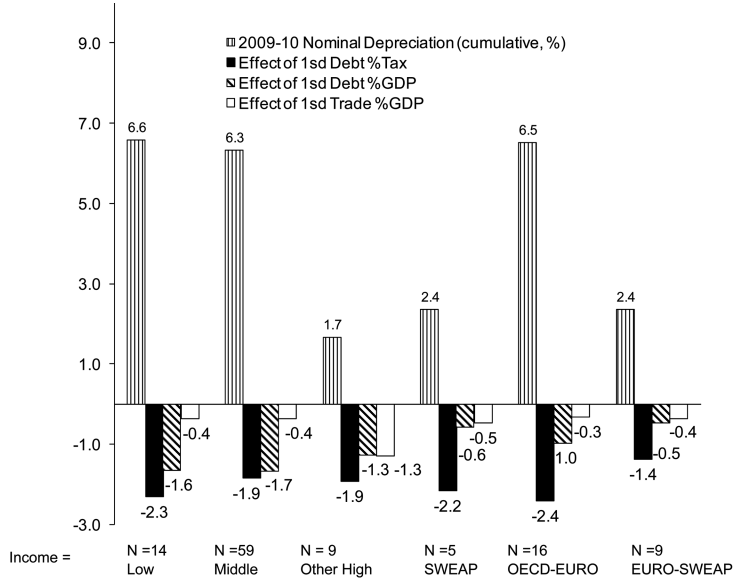

Fig. 5. Cumulative 2009–2010 nominal depreciation (%) and economic significance on the size of crisis fiscal stimulus %GDP, by income group.

Note: This figure reports the economic effects due to a one standard deviation increase of Debt/GDP (equation [19]), Debt/Tax base (equation [22]), and trade openness/GDP (average of equations [19] and [22]). The depreciation are actual (realized), while the rest are estimated effects. SWEAP includes Greece, Ireland, Italy, Portugal, and Spain.

marginal impact of public debt/average tax base and trade openness. As before, we find that the fiscal stimuli is negatively associated with trade openness. The interaction between trade/GDP and a depreciation dummy (equal to 1 if depreciation in 2007–2009) suggests that higher trade/GDP is associated with larger depreciation. The results support the substitutability between fiscal space and depreciations.

We conduct a number of robustness checks in panels B and C of table 6. We run a horse race between our fiscal space measure—debt/tax and the conventional measure—debt/GDP in columns (27) and (28) of table 6.B. The results show that debt/tax has a stronger effect on the size of fiscal stimulus than debt/GDP. Next, in columns (29) and (30) we run two separate regressions for years 2009 and 2010 and find supportive evidence to our main results. In order to control for the fact that some countries were hit harder than others, we add trade and financial exposure to the United States, and terms of trade and unemployment to the estimation. This is done in table 6, panel C, columns

Table 6
Fiscal Stimuli of 2009–2010 and Depreciation of 2009–2010

A	SUR		SUR		SUR		SUR	
	Stimulus	Depreciation	Bailout	Depreciation	Stimulus	Depreciation	Bailout	Depreciation
	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)
	(23)		(24)		(25)		(26)	
Instrumented debt %GDP	−.066***		.018					
	(.022)		(.043)					
Instrumented debt %Tax					−.007***		−.004	
					(.002)		(.004)	
State fragility	.048		−.199*		.087		−.144	
	(.070)		(.102)		(.057)		(.114)	
Trade openness %GDP	−.010**		−.001		−.012***		−.006	
	(.005)		(.008)		(.004)		(.007)	
Trade openness %GDP × positive depreciation (0/1)		.135***		.137***		.136***		.137***
		(.020)		(.019)		(.020)		(.019)
Financial openness		.165		.150		.158		.183
		(.629)		(.626)		(.629)		(.625)
Growth rate of total	−.279***		.077		−.102		−.072	
Real GDP	(.107)		(.209)		(.068)		(.136)	
Government share of real	.092*		−.006		.046		.037	
GDP per capita	(.056)		(.108)		(.050)		(.099)	
Probability of a positive	1.476		1.923		.229		−.755	
outcome (from probit)	(1.449)		(1.744)		(.946)		(1.748)	
Inflation		3.608***		3.572***		3.618***		3.564***
		(1.025)		(1.017)		(1.025)		(1.017)
Foreign reserves %GDP		−.142		−.164*		−.143		−.166*
		(.093)		(.092)		(.093)		(.092)
Euro countries (0/1)		−8.613***		−7.697***		−8.577***		−7.703***
		(2.872)		(2.853)		(2.873)		(2.851)
R^2	.19366	.44544	.09974	.44442	.22514	.44547	.09441	.44433
Countries	112		112		112		112	

(*continued*)

Table 6
Continued

B	SUR: Year = 2009 + 2010		SUR: Year = 2009 + 2010		SUR: Year = 2009		SUR: Year = 2010	
	Stimulus	Bailout	Stimulus	Depreciation	Stimulus	Depreciation	Stimulus	Depreciation
	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)
	(27)		(28)		(29)		(30)	
Instrumented debt %GDP	.012	−.075	.011					
	(.039)	(.227)	(.039)					
Instrumented debt %Tax	−.009**	.033	−.008**		−.004***		−.003***	
	(.004)	(.078)	(.004)		(.001)		(.001)	
State fragility	.161*		.093		.021		.068**	
	(.087)		(.060)		(.032)		(.032)	
Trade openness %GDP	−.008		−.011***		−.007***		−.004*	
	(.005)		(.004)		(.002)		(.002)	
Trade openness %GDP × positive depreciation (0/1)				.136***		.089***		.046***
				(.020)		(.022)		(.013)
Financial openness		−.459		.158		1.028		−.771*
		(1.350)		(.629)		(.692)		(.409)
Growth rate of total real GDP	−.084		−.070		−.063*		−.042	
	(.134)		(.134)		(.038)		(.038)	
Government share of real GDP per capita	.048		.038		.015		.029	
	(.058)		(.058)		(.027)		(.027)	
Real GDP per capita		4.675						
		(8.626)						
Inflation				3.619***		1.506		2.170***
				(1.025)		(1.127)		(.666)
Foreign reserves %GDP				−.143		−.077		−.058
				(.093)		(.102)		(.060)
Euro countries (0/1)				−8.569***		−13.961***		4.813***
				(2.873)		(3.160)		(1.866)
R^2	.23345	.18488	.22570	.44547	.26973	.22938	.13800	.35035
Countries	112		112		112		112	

Table 6
Continued

C	SUR: Year = 2009 + 2010		SUR: Year = 2009		SUR: Year = 2009		SUR: Year = 2009	
	Stimulus	$Depreciation	Stimulus	$Depreciation	Stimulus	Eff. Depre.	Stimulus	Eff. Depre.
	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)
	(31)		(32)		(33)		(34)	
Debt %GDP	.019							
	(.027)							
Debt %Tax	−.006**		−.004***		−.003*		−.004**	
	(.003)		(.001)		(.002)		(.002)	
Trade exposure w/ US	.230***		.124***		.158***		.181***	
	(.062)		(.033)		(.044)		(.046)	
Trade openness %GDP × positive depreciation (0/1)		.146***		.141***		.016		.017
		(.024)		(.026)		(.031)		(.033)
Terms of trade improvement		−.361***		−.094		−.354***		−.370***
		(.110)		(.114)		(.133)		(.132)
Unemployment	.060		.047		.037		.059	
	(.056)		(.032)		(.038)		(.040)	
Euro countries (0/1)		−12.099***		−11.523***		−4.537		−4.972
		(3.342)		(3.444)		(3.593)		(3.587)
External debt/GDP		10.935***		8.892**		16.798**		16.434**
		(4.038)		(4.315)		(7.780)		(8.083)

(*continued*)

Table 6
Continued

C	SUR: Year = 2009 + 2010		SUR: Year = 2009		SUR: Year = 2009		SUR: Year = 2009	
	Stimulus	$Depreciation	Stimulus	$Depreciation	Stimulus	Eff. Depre.	Stimulus	Eff. Depre.
	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)
	(31)		(32)		(33)		(34)	
Financial exposure w / US		−.149		−.161		−.646		
		(.289)		(.309)		(.393)		
. . . country holding of US assets								−.931
								(1.220)
. . . US holding of country assets								.291
								(1.295)
R^2	.29090	.48638	.35781	.40342	.42865	.28452	.44978	.32016
Countries	62		63		38		35	

Notes: Standard errors are in parentheses. This table reports the cross-country SUR estimation results with the size of stimulus (or bailout) and depreciation as two dependent variables. The fiscal space is calculated from public debt as of 2006 and 2000–2005 average tax/GDP. Positive depreciation (0/1) is a dummy variable, equal to 1 if exchange rate depreciated cumulatively from January 2009 to December 2010. Euro countries (0/1) is a dummy variable, equal to 1 if a country is a member of the eurozone. (A) Probability of a positive outcome is estimated from the probit regression of a stimulus incidence (1 if stimulus, 0 if none) on fiscal space, state fragility, and trade openness. (C) Trade exposure with United States is export to the USA/GDP. Effective depreciation is calculated from real effective exchange rate index (2005 = 100). Terms of trade improvement is calculated from the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000. Unemployment is the share of the labor force that is without work but available for and seeking employment. Financial exposure with United States is the country holding of US assets and US holding of country assets to GDP.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

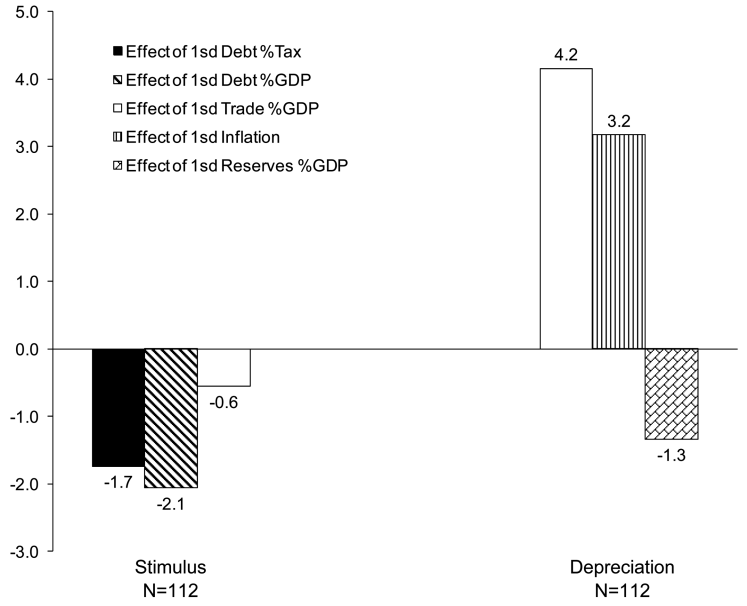

Fig. 6. Economic significance on the size of crisis fiscal stimulus %GDP of 2009–2010 and the size of 2009–2010 nominal depreciation (cumulative, %).

Notes: This figure reports the economic effects due to a one standard deviation increase of Debt/GDP (equation [23]), Debt/Tax base (equation [25]), Trade openness/GDP (average of equations [23] and [25]), inflation (average of equations [23] and [25]), and foreign reserves/GDP (average of equations [23] and [25]).

(32) and (34)—we find that the effect of fiscal space is robust to these controls. To account for the issues of borrowing in foreign currency, we add External Debt/GDP to the estimation of panel C in columns (31) through (34). Controlling for external debt, we continue to find the effect of fiscal space on the size of fiscal stimulus. In addition, we also find that higher trade exposure (as measured by the export to the US/GDP) and terms of trade deterioration are associated with larger depreciation. We also check whether our findings depend on whether we use trade-weighted exchange rate depreciations or dollar based ones. This is done in panel C, columns (33) and (34). Using the trade-weighted exchange rate depreciations, subject to data availability, we still find consistently the associations between openness, fiscal space, and the size of fiscal stimulus.

Figure 6 provides the economic significance of the cross-country estimates in regressions (columns [23] and [25] in table 6, panel A). For

each explanatory variable, we multiply its standard deviation with the estimated coefficient in the corresponding regression, approximating the effect of its one standard deviation change on the size of the fiscal stimulus. The size of the stimulus in 2009–2011 is larger in countries with larger fiscal space and lower trade/GDP, while the extent of nominal depreciation is greater in countries with higher trade/GDP and lower foreign reserves/GDP. The negative effects of public debt/GDP and public debt/tax base on the size of the fiscal stimuli are similar (though the latter performs better in various econometric specifications), shrinking the crisis-related fiscal stimulus by approximately 2% GDP. An increase of trade openness by a one standard deviation (0.5) is associated with a higher cumulative depreciation during 2007–2009 of 6.8 percentage points. An increase of international reserves by a one standard deviation is associated with lower cumulative depreciation during 2007–2009 of 3.1 percentage points.

Finally, table 7 illustrates the key importance of the de facto fiscal space (i.e., the public debt/GDP normalized by the tax base) in explaining the dynamics of CDS (credit default swap) spreads and SWEAP pricing differentials. Aizenman, Hutchison, and Jinjarak (2011) estimate the dynamics and structure of CDS pricing over the 2003–2010 sample period; the dependent variables are sovereign CDS spreads of three-, five-, and ten-year maturities.[10] This is done in a dynamic panel regression: $\Delta y_{it} = \alpha \Delta y_{it-1} + \Delta x_{it}' \beta + \Delta \varepsilon_{it}$; where y is the CDS spread, i stands for country and t for year, and x is a vector of controls. Our objectives are threefold. We determine whether CDS spreads are related to fiscal space measures in a panel regression setting, whether there is an identifiable dynamic pattern to CDS spreads during the crisis period, and we investigate pricing differentials of CDS spreads in the Euro and the SWEAP countries, compared to other countries. We seek to answer whether SWEAP CDS spreads follow the same pattern as the rest of the world, and the degree to which they were "mispriced," especially during the 2010 European debt crisis.

In order to investigate CDS pricing dynamics during the global and European financial turmoil, we included time dummy variables for three crisis years: 2008 is identified as the year of the global financial crisis, 2009 is identified as a partial recovery period, and 2010 is identified with the SWEAP debt crisis and post-global financial crisis. The top panel of table 7 reports the differential pricing for Eurozone and the bottom panel for the SWEAP countries. We also include interactions of

Table 7
Dynamics of CDS Spreads

							Balanced Sample: 2005–2010					
	Coeff. (1)	(s.e.)	Coeff. (2)	(s.e.)	Coeff. (3)	(s.e.)	Coeff. (4)	(s.e.)	Coeff. (5)	(s.e.)	Coeff. (6)	(s.e.)
t2008	323.6	(76.3)***	354.8	(79.7)***	322.6	(88.4)***	282.8	(77.2)***	348.7	(85.7)***	353.0	(9.3)***
t2009	–39.6	(33.1)	–4.9	(45.1)	8.6	(31.4)**	21.8	(27.0)	121.4	(46.8)***	131.5	(24.1)***
t2010	.3	(32.9)	–27.1	(41.9)	53.9	(21.6)**	82.1	(29.3)***	78.4	(39.8)**	89.3	(19.0)***
t2008 × Euro dummy	–223.8	(81.0)***	–245.5	(86.7)***	–20.7	(66.1)***	–191.7	(79.2)**	–236.6	(85.8)***	–215.9	(71.8)***
t2009 × Euro dummy	15.0	(29.8)	–35.0	(33.4)	–27.7	(26.1)	–7.4	(3.3)	–104.8	(43.0)**	–25.4	(29.3)
t2010 × Euro dummy	5.8	(26.8)	1.9	(33.9)	16.9	(31.5)	–19.4	(28.9)	–31.8	(42.4)	32.0	(3.2)
t2008 × SWEAP	–251.6	(97.5)***	–305.7	(99.6)***	–22.9	(68.7)***	–141.0	(81.2)*	–186.2	(88.1)**	–214.2	(83.0)***
t2009 × SWEAP	12.4	(59.3)	–7.2	(64.7)	–12.9	(38.3)	83.9	(35.4)**	–3.5	(46.9)	2.5	(37.2)
t2010 × SWEAP	178.9	(108.1)*	124.7	(132.8)	236.7	(52.0)***	274.9	(63.9)***	25.5	(84.6)***	29.5	(56.1)***
TED Spread	6.0	(27.1)	–.4	(33.2)	–17.0	(1.4)	–1.6	(29.6)	–28.8	(34.0)	–13.1	(13.2)
$y(t-1)$	.2	(.1)**					.3	(.1)***				
Trade/GDP	–61.3	(151.7)	–13.2	(192.3)	–59.0	(33.8)*	–121.9	(132.1)	–155.3	(15.5)	–59.2	(43.8)
Inflation	22.9	(11.5)**	26.2	(12.3)**	29.5	(6.9)***	2.2	(1.5)*	24.7	(11.4)**	29.3	(7.1)***
External debt/GDP	–37.2	(29.4)	–57.6	(37.9)	6.7	(2.4)***	4.5	(18.7)	9.4	(26.7)	13.6	(2.1)***
Fiscal balance/Tax base	–859.7	(299.9)***	–1222.6	(336.4)***	–333.0	(88.2)***						
Public debt/Tax base							64.7	(28.9)**	104.0	(59.4)*	24.8	(7.3)***
Constant term	253.0	(26.8)	309.0	(305.6)	–15.9	(3.4)	–531.5	(342.1)	–874.0	(689.7)	–73.7	(44.1)*
R^2	.52		.51		.41		.45		.50		.41	
Observations	300		300		300		300		300		300	
Countries (i)	50		50		50		50		50		50	
Fixed effects	Yes		Yes		No		Yes		Yes		No	
Serial correlation	$y(t-1)$		No			clustered s.e. (i)	$y(t-1)$		No			clustered s.e. (i)

Notes: The dependent variable (y) is sovereign CDS five-year tenor in basis points. South-West Euro Area Periphery (SWEAP) includes Greece, Ireland, Italy, Portugal, and Spain. Tax base is an average Tax/GDP over a period of previous five years. TED Spread (3-month US$ LIBOR – 3-month US Treasury) and Inflation are in percent. All variables are in real-time (t), except the lagged CDS, $y(t-1)$. Standard errors are in parentheses.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

a dummy for Eurozone and SWEAP countries with the time dummy variables.

The sample covers a panel of 54 countries with CDS spreads from 2003 to 2010. The estimation methodology follows the Arellano-Bond dynamic panel estimator, which accounts for the correlation of a lagged dependent variable and the unobserved error terms. The dependent variable is 100 × ln(sovereign spreads), allowing the coefficients to be interpreted in terms of a percentage change of sovereign default risks (this terminology also aligns with standard practice in the financial sector that discusses the percentage change of CDS spreads). In all of the CDS spread regressions, the de facto fiscal space measure (higher value is equivalent to lower fiscal capacity) is positive and statistically significant at the 1% level—higher level of debt/average tax base increases significantly the pricing of the sovereign default risk. Given the mean 10-year CDS pre–2008 of 96 basis points, a one standard deviation increase (2.5) of the debt/tax base ratio increases the 10-year CDS spread by 2.5 × 30% × 96 = 72 basis points. A decline in US interest rates increases CDS spreads across the maturity spectrum—an important factor during our sample period since the US 10-year government bond yield dropped from 4.0 percentage point in 2007 to 1.7 percentage points at the end of 2010. The test statistics (*p*-values reported) also indicate that these dynamic panel regressions perform reasonably well on the whole sample.[11]

In addition, all of the coefficients on the 2008–2010 year dummy variables are economically large and statistically significant. Controlling for other factors, sovereign spreads in 2008 jumped by 41 to 47% over the maturity spectrum, relative to average rates over the 2003–2010 period. Spreads were relatively higher in 2009 than precrisis. Spreads fell sharply in 2010, again across the maturity spectrum, reaching average levels below the conditional period average, once controlling for the deteriorating debt situation and declining US interest rates.

For Euro countries (table 7, upper panel), and particularly the SWEAP group (lower panel), sovereign spreads rose substantially more in 2008 compared to the international average. SWEAP CDS spreads climbed 41 to 68% above the average spreads prevailing in 2008, declined modestly in 2009, and jumped to very high levels above the average in 2010. Given the mean of CDS spreads of non-SWEAP countries at pre–2008 level, the SWEAP CDS spreads were 165.1% (≡ 85 basis points) higher than the sample average in 2010 at the three-year maturity; 126.3% (≡ 90 basis points) higher at the five-year maturity; and 125.8% (≡ 104 basis

points) higher at the 10-year maturity. The Euro area, driven in large part by the CDS spreads in the SWEAP group, experienced a similar, but less extreme, pattern. It is evident that the sovereign default risk in the Euro area, and the SWEAP group in particular, were priced much higher than the average of other countries, and moved in the opposite direction to the international trend in 2010. Risk assessments were falling in 2010 but rose sharply in the Euro area and in the SWEAP group. The public debt/average tax base appears to be the key fundamental in accounting for the sovereign risk dynamics. Aizenman et al. (2011) consider the broader role played by the public debt/tax base and other economic fundamentals in the evolution of CDS spreads as well as structural changes due to the global debt crisis of 2008 to the present.

V. Concluding Remarks

We show the importance of precrisis fiscal space in accounting for the fiscal stimulus during 2009–2011. We also find that higher trade openness had been associated with a smaller fiscal stimulus, and with greater exchange rate depreciation. Economically, these effects are large: a one standard deviation increase of the public debt/average tax base lowers the size of the fiscal stimulus by 2% of GDP. A one standard deviation increase of trade/GDP increases the extent of nominal depreciation by about 7 percentage points. A possible interpretation is that a higher public debt/average tax base reduces the supply elasticity of funds facing the treasury, thereby reducing the viability of a countercyclical fiscal policy. As fiscal multipliers tend to be lower in more open countries, these countries opted for a smaller fiscal stimulus, putting greater weight on adjustment via exchange rate depreciation ("exporting their way to prosperity"). Overall, these results are consistent with the neo-Keynesian open economy framework, and with the importance of fiscal space in measuring the viability of countercyclical policies.

Data Appendix A

Table A1

Variable	Description	Source
Crisis fiscal stimulus %GDP Financial sector bailout %GDP	The estimates are discretionary crisis related government expenditures for the years 2009–2011. In the regression, both the fiscal stimuli and financial bailouts are the total sum of their estimates of the years 2009–2010.	IMF publications and Fiscal Monitor, various issues
Exchange rate depreciation	The exchange rate adjustment is the cumulative depreciation during 2009–2010. The change is calculated from (annual average) exchange rate per US dollar. Effective depreciation is calculated from real effective exchange rate index (2005 = 100).	PWT (Penn World Table) 7.0
Public debt %GDP	Gross government debt/GDP	Historical Public Debt database Fiscal Affairs Department, IMF
Tax %GDP	Lagged five-year moving average tax/GDP. The moving average is to account for business cycle fluctuations. The tax base is at the level of central government. For regression analysis, average 2000–2005 tax %GDP is used.	WDI (World Development Indicators)
Fiscal balance %GDP	Cash surplus (deficit)/GDP	WDI
State fragility	0–25; where 25 = extreme fragility. The scores are based on security, political, economic, and social dimension at the end of the year 2009.	ICRG (International Country Risk Guide)
Trade openness %GDP	(exports + imports)/GDP in constant prices	PWT 7.0

Financial openness	de jure capital account openness based on the IMF classification	Chinn-Ito index
Real GDP per capita	Real GDP per capita (Constant Prices: Laspeyres; log), derived from growth rates of c, g, i	PWT 7.0
Growth rate of total real GDP	Growth rate of Total Real GDP Laspeyres	PWT 7.0
Government share of real GDP per capita	The values are in constant prices.	PWT 7.0
Legal origins	English, French, or German origins, with Scandinavia as an omitted category in the regressions.	La Porta, Lopez-de-Silanes, and Shleifer (2008)
Sovereign spreads on CDS	The sovereign credit default swap pricing is based on quotes collected from a consortium of over 30 independent swap market participants.	CMA (Credit Market Analysis) Datavision
US interest rate	Yields of the 10-year US Treasury bonds (%)	Datastream
Trade exposure with US	Export to the US/GDP	International Trade Commission
Financial exposure with US	Country holding of US assets and US holding of country assets to GDP	US Bureau of Economic Analysis
Terms of Trade Improvement	Percentage ratio of the export unit value indexes to the import unit value indexes	WDI
Unemployment	Share of the labor force that is without work but available for and seeking employment	WDI

Data Appendix B

Table B1

Income Group	Country	ISO	Tax Base Avg. 2000–2005 (I) %	Public Debt 2006 (II) %	Fiscal Space 1 (II)/(I)	Fiscal Balance Avg. 2000–2006 (III) %	Fiscal Space 2 (III)/(I)
A. Low income	Bangladesh	BGD *	7.8	49.5	6.3	–.7	–.09
	Benin	BEN *	15.6	5.2	2.8	–.1	–.02
	Burkina Faso	BFA *	11.7	44.5	2.8	–4.9	–.43
	Burundi	BDI *	13.6	129.9	1.6		
	Cambodia	KHM*	8.0	38.1	4.9	–2.3	–.26
	Ghana	GHA *	18.0	113.3	5.3	–4.1	–.20
	Kenya	KEN *	16.7	53.1	3.2	.2	.01
	Kyrgyz Republic	KGZ *	12.6	87.7	7.0	–1.4	–.11
	Madagascar	MDG*	1.1	96.8	9.0	–3.4	–.35
	Nepal	NPL *	8.8	59.3	6.8	–1.2	–.13
	Tajikistan	TJK *	8.3	6.4	7.4	–3.0	–.37
	Togo	TGO *	14.3	94.5	5.7	–3.2	–.32
	Uganda	UGA *	1.8	76.7	7.1	–1.9	–.18
	Zambia	ZMB *	17.8	154.0	8.6	.1	.01
B. Middle income	Albania	ALB *	14.2	62.7	4.6	–4.2	–.31
	Algeria	DZA *	9.7	46.2	3.2	5.0	.69
	Argentina	ARG *	11.3	99.1	9.7	–3.0	–.16
	Armenia	ARM *	14.0	3.3	1.6	–.7	–.05
	Azerbaijan	AZE *	12.3	19.8	1.9		
	Belarus	BLR *	17.1	9.6	.6	.1	.01
	Bhutan	BTN *	8.6	68.6	7.9	–3.3	–.40
	Bolivia	BOL *	13.6	63.6	5.0	–2.6	–.10
	Bosnia and Herzegovina	BIH *	19.6	28.9	1.2	1.8	.11
	Botswana	BWA *	15.5	8.6	.6		
	Brazil	BRA *	29.9	71.5	2.4	–4.5	–.16
	Bulgaria	BGR *	18.3	45.0	2.5	1.1	.06

Cameroon	CMR	*	1.3	76.5	6.1	2.3	.37
Chile	CHL	*	19.5	11.5	.6	1.6	.08
China	CHN	*	8.7	17.9	1.9	−1.3	−.14
Costa Rica	CRI	*	13.3	4.8	3.1	1.0	.07
Côte d'Ivoire	CIV	*	14.4	87.7	5.9	−3.0	−.21
Dominican Republic	DOM	*	13.3	3.3	2.7	−.9	−.05
Ecuador	ECU	*	1.5	5.6	3.3	.6	.08
Egypt, Arab Rep.	EGY	*	14.8	96.7	6.8	−6.4	−.46
El Salvador	SLV	*	11.0	37.3	3.6	−3.6	−.30
Fiji	FJI	*	21.7	46.2	2.1	−2.1	−.14
Georgia	GEO	*	7.9	44.9	5.8	−.1	−.01
Guatemala	GTM	*	1.3	21.7	2.1	−1.7	−.17
Honduras	HND	*	14.0	56.6	3.4	−.9	−.02
India	IND	*	8.8	8.2	9.1	−3.6	−.41
Indonesia	IDN	*	13.7	63.7	4.6	−1.2	−.09
Iran, Islamic Rep.	IRN	*	7.5	22.9	3.1	2.6	.39
Jamaica	JAM	*	24.8	10.3	3.9	−2.0	−.08
Kazakhstan	KAZ	*	9.8	14.7	1.7	.6	.05
Lebanon	LBN	*	13.1	164.8	12.9	−12.4	−.89
Lesotho	LSO	*	39.0	87.2	2.2	3.2	.08
Lithuania	LTU	*	15.5	2.8	1.3	−1.3	−.07
Macedonia, FYR	MKD	*	19.8	41.0	2.0	1.2	−.01
Malaysia	MYS	*	16.7	42.6	2.6	−4.0	−.24
Mauritius	MUS	*	16.2	53.5	3.3	−2.8	−.17
Mexico	MEX	*	16.4	43.0	2.6	−.1	−.01
Moldova	MDA	*	15.0	59.4	3.9	.6	.04
Mongolia	MNG	*	13.9	74.3	5.6	.5	.03
Morocco	MAR	*	2.0	65.6	3.1	−2.0	−.08
Namibia	NAM	*	27.7	24.5	.9	−1.8	−.06
Pakistan	PAK	*	11.4	73.6	6.4	−3.3	−.29
Panama	PAN	*	1.4	65.2	6.3	.0	.01
Papua New Guinea	PNG	*	21.8	5.6	2.3	−1.8	−.08
Paraguay	PRY	*	11.9	46.9	2.3	1.2	.10

(*continued*)

Table B1
Continued

Income Group	Country	ISO	Tax Base Avg. 2000–2005 (I) %	Public Debt 2006 (II) %	Fiscal Space 1 (II)/(I)	Fiscal Balance Avg. 2000–2006 (III) %	Fiscal Space 2 (III)/(I)
	Peru	PER *	12.9	38.6	3.0	−1.1	−.08
	Philippines	PHL *	14.2	64.4	4.5	−3.4	−.24
	Romania	ROM *	12.0	21.5	1.7	−1.5	−.11
	Russian Federation	RUS *	13.5	32.0	1.4	5.6	.38
	Senegal	SEN *	15.6	51.8	3.3	−1.5	−.10
	South Africa	ZAF *	24.4	36.7	1.5	−1.2	−.04
	Sri Lanka	LKA *	14.6	97.1	6.7	−7.6	−.52
	Thailand	THA *	15.8	5.5	2.9	1.8	.12
	Tunisia	TUN *	21.0	57.1	2.7	−2.6	−.12
	Turkey	TUR *	23.3	61.1	2.6	1.9	.08
	Ukraine	UKR *	13.3	28.8	2.2	−1.0	−.07
	Uruguay	URY *	16.1	73.9	4.6	−2.9	−.18
	Venezuela, RB	VEN *	13.0	38.2	2.9	−2.0	−.14
	Vietnam	VNM *	12.6	41.7	3.4	−4.2	−.33
C. Other High Income	Croatia	HRV *	22.4	44.2	2.0	−3.4	−.15
	Estonia	EST *	16.9	5.0	.3	1.1	.07
	Hong Kong SAR, China	HKG *	11.1	17.6	1.6	−1.3	.23
	Latvia	LVA *	14.8	14.5	1.0	−1.3	−.08
	Oman	OMN *	7.3	17.0	2.3	−3.6	−.48
	Qatar	QAT *	24.5	37.6	.7	11.7	.38
	Saudi Arabia	SAU *	34.0	7.1	1.9	6.8	.25
	Singapore	SGP *	14.7	94.1	6.4	6.0	.41
	Trinidad and Tobago	TTO *	22.0	46.8	2.1	2.3	.11
D. SWEAP	Greece	GRC *	32.7	10.3	3.1	−6.9	−.21
	Ireland	IRL *	3.4	31.2	1.0	1.4	.05
	Italy	ITA *	41.9	106.3	2.5	−2.9	−.07
	Portugal	PRT *	32.6	57.9	1.8	−3.5	−.11

	Spain	ESP	*	33.8	49.3	1.5	−.5	−.01
E. OECD–EURO	Australia	AUS	*	29.4	13.7	.5	1.0	.03
	Canada	CAN	*	35.3	76.5	2.2	.8	.02
	Czech Republic	CZE	*	36.1	27.2	.8	−4.2	−.12
	Denmark	DNK	*	49.0	53.4	1.1	2.0	.04
	Hungary	HUN	*	38.1	58.2	1.5	−6.3	−.17
	Iceland	ISL	*	35.6	37.1	1.0	1.3	.03
	Israel	ISR	*	36.3	92.0	2.5	−3.8	−.11
	Japan	JPN	*	26.7	169.0	6.3	−5.5	−.20
	Korea, Rep.	KOR	*	22.0	22.0	1.0	.3	.02
	New Zealand	NZL	*	33.7	25.7	.8	3.8	.11
	Norway	NOR	*	42.5	45.8	1.1	13.2	.31
	Poland	POL	*	34.0	43.4	1.3	−4.2	−.12
	Sweden	SWE	*	49.7	55.8	1.1	1.2	.02
	Switzerland	CHE	*	29.0	52.4	1.8	−.9	−.03
	United Kingdom	GBR	*	35.3	4.0	1.1	−1.6	−.05
	United States	USA	*	28.0	58.7	2.1	−1.8	−.06
F. EURO–SWEAP	Austria	AUT	*	43.9	65.3	1.5	−2.0	−.05
	Belgium	BEL	*	44.7	98.6	2.2	−.6	−.01
	Cyprus	CYP	*	22.3	62.6	2.8	−3.2	−.14
	Finland	FIN	*	45.6	42.6	.9	.7	.02
	France	FRA	*	44.1	61.5	1.4	−2.6	−.06
	Germany	DEU	*	36.3	63.5	1.8	−1.3	−.04
	Netherlands	NLD	*	39.0	5.8	1.3	−.7	−.02
	Slovak Republic	SVK	*	34.32	35.80	1.05	−5.93	−.17
	Slovenia	SVN	*	37.88	27.23	.72	−2.45	−.06

Notes: This table reports the measures of fiscal space based on 2000 to 2006 data. The denominator, Tax Base, is average tax revenue/GDP from 2000–2005. Public Debt is public debt/GDP as of 2006. Fiscal Balance is average fiscal balance/GDP from 2000–2006 (positive is surplus).
* Denotes countries included in regression analysis.

Endnotes

Prepared for the NBER International Seminar on Macroeconomics, June 2011, Malta. We are grateful to the insightful comments of the discussants, Menzie Chinn and Francesco Giavazzi, and from Jeff Frankel, Jorge Braga de Macedo, Assaf Razin, Andy Rose, and the conference participants. All errors are ours. For acknowledgments, sources of research support, and disclosure of the authors' material financial relationships, if any, please see http://www.nber.org/chapters/c12498.ack.

1. See Meade (1951a, 1951b); Fleming (1962); Mundell (1963); Dornbusch (1980); and Obstfeld and Rogoff (1996) for important steps in the evolving neo-Keynesian open economy model.

2. Needless to say, these considerations ignore the externalities imposed by these trade-offs on other countries, increasing the potential role of global coordination in mitigating "beggar-thy-neighbor" attitudes.

3. Heller (2005) defined it "as room in a government's budget that allows it to provide resources for a desired purpose without jeopardizing the sustainability of its financial position or the stability of the economy." Ghosh et al. (2011) defined "fiscal fatigue" as a situation where government's ability to increase primary balances cannot keep pace with the rising debt.

4. See Irons and Bivens (2010) for a critical review of this result.

5. Note also that a country's fiscal space is not independent of the assumptions about growth and the real rate of interest, themselves possibly endogenous with respect to taxes and spending. These factors should play a more pertinent role in explaining the long-run patterns of government spending and growth, and are overlooked by our study as we focus on the fiscal stimuli in the first two years following the events of 2007–2008.

6. See Stock and Watson (2002) for analysis of the Great Moderation hypothesis. Recent observers refer to 1987–2007 as the "Great Moderation" period.

7. This inference is in line with Aizenman and Pasricha (2010), finding that the projected flow cost of public debt is low for about half of the OECD countries.

8. The variable takes on the value of 0–25; where 25 = extreme fragility. The scores are based on security, political, economic, and social dimension at the end of the year 2009.

9. See Besley and Persson (2009) for the role of legal origins on fiscal capacities.

10. Our CDS data set contains one- to ten-year maturities. We focus on three-, five-, and ten-year in this table, and our baseline estimates focus on the ten-year maturity. While there is no precise international account of government debt maturity, recent statistics suggest that the average original maturity of central government debts is around ten years for both emerging markets and industrial countries (Bank for International Settlements [BIS] 2010). See Aizenman et al. (2011) for further details.

11. The Sargan test of overidentifying restrictions has a null hypothesis of exogenous instruments; in all cases, corresponding p-values of the Sargan test cannot reject the null. The AR(1) test has a null of no autocorrelation in first differences and the AR(2) test has a null of no autocorrelation in levels; in all cases, the test cannot reject that average autocovariance in residuals of order 1 and 2 (AR(1)) is 0. The Sargan test provides some level of confidence that the residuals are uncorrelated with a group of explanatory variables.

References

Aizenman, J., M. J. Hutchison, and Y. Jinjarak. 2011. "What Is the Risk of European Sovereign Debt Defaults? Fiscal Space, CDS Spreads and Market Mispricing of Risk." University of California, Santa Cruz.

———. 2011. "Income Inequality and Taxation: A Cross-Country Analysis." The School of Oriental and African Studies (SOAS), University of London.

Aizenman J., and G. Pasricha. 2010. "Fiscal Fragility: What the Past May Say About the Future." NBER Working Paper no. 16478. Cambridge, MA: National Bureau of Economic Research, October.
Alm, James, and Benno Torgler. 2006. "Culture Differences and Tax Morale in the United States and in Europe." *Journal of Economic Psychology* 27:224–46.
Auerbach, A., and Y. Gorodnichenko. 2010. "Measuring the Output Responses to Fiscal Policy." NBER Working Paper no. 16311. Cambridge, MA: National Bureau of Economic Research, August.
Bank for International Settlements. 2010. *BIS Quarterly Review*, OTC Derivatives Statistics. December.
Barro, R. J., and C. J. Redlick. 2009. "Macroeconomic Effects from Government Purchases and Taxes." Harvard University Working Paper, November.
Besley, T., and T. Persson. 2009. "The Origins of State Capacity: Property Rights, Taxation, and Politics." *American Economic Review* 99 (4): 1218–44.
Blanchard, O. 2008. *Macroeconomics*, 5th ed. Englewood Cliffs, NJ: Prentice Hall.
Christiano, L., M. Eichenbaum, and S. Rebelo. 2009. "When Is the Government Spending Multiplier Large?" NBER Working Paper no. 15394. Cambridge, MA: National Bureau of Economic Research, October.
Dolls, M., C. Fuest, and A. Peichl. 2010. "Automatic Stabilizers and Economic Crisis: US vs. Europe." NBER Working Paper no. 16275. Cambridge, MA: National Bureau of Economic Research, August.
Dornbusch, R. 1980. "Exchange Rate Economics: Where Do We Stand?" Brookings Papers on Economic Activity, Economic Studies Program, The Brookings Institution, vol. 11 (1): 143–206.
Fiscal Monitor. 2010. "Navigating the Fiscal Challenges Ahead." Fiscal Affairs Department, International Monetary Fund (IMF), May-November.
Fleming, J. Marcus. 1962. "Domestic Financial Policies under Fixed and under Floating Exchange Rates." *Staff Papers, International Monetary Fund* 9:369–79.
Frey, S. Bruno, and Benno Torgler. 2007. "Tax Morale and Conditional Cooperation." *Journal of Comparative Economics* 35:136–59.
Ghosh, A. R., J. I. Kim, E. G. Mendoza, J. D. Ostry, and M. S. Qureshi. 2011. "Fiscal Fatigue, Fiscal Space and Debt Sustainability in Advanced Economies." NBER Working Paper no. 16782. Cambridge, MA: National Bureau of Economic Research, February.
Gordon J. R., and R. Krenn. 2010. "The End of the Great Depression 1939-41: Policy Contributions and Fiscal Multipliers." NBER Working Paper no. 16380. Cambridge, MA: National Bureau of Economic Research, September.
Heller, S. P. 2005. "Back to Basics — Fiscal Space: What It Is and How to Get It." *Finance and Development* 42 (2). http://www.imf.org/external/pubs/ft/fandd/2005/06/basics.htm
Ilzetzki, E., E. G. Mendoza, and C. A. Végh. 2010. "How Big (Small?) Are Fiscal Multipliers?" NBER Working Paper no. 16479. Cambridge, MA: National Bureau of Economic Research, October.
Irons, J. S., and J. Bivens. 2010. "Government Debt and Economic Growth." Economic Policy Institute Briefing Paper no. 271.
La Porta, R., F. Lopez-de-Silanes, and A. Shleifer. 2008. "The Economic Consequences of Legal Origins." *Journal of Economic Literature* 46 (2): 285–332.
Meade, James E. 1951a. *The Balance of Payments; Mathematical Supplement: The Theory of International Economic Policy*, vol. 1. London: Oxford University Press.

———. 1951b. *The Balance of Payments: The Theory of International Economic Policy*, vol. 1. London: Oxford University Press.

Mundell, Robert A. 1963. "Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates." *Canadian Journal of Economics and Political Science* 29:475–85.

Obstfeld, Maurice, and Kenneth Rogoff. 1996. *Foundations of International Macroeconomics*. Cambridge, MA: MIT Press.

Reinhart, C. M., and K. S. Rogoff. 2010. "Growth in a Time of Debt." *American Economic Review* 100 (2): 573–78.

Stock, J. H., and M. W. Watson. 2003. "Has the Business Cycle Changed and Why?" In *NBER Macroeconomics Annual 2002*, vol. 17, edited by Mark Gertler and Kenneth Rogoff, 159–218. Cambridge, MA: MIT Press.